SOLVING THE PROBLEM OF THE COSMOLOGICAL CONSTANT

A theory called Exact Classical Mechanics (ECM) questions the validity of Einstein's general relativity and poses an alternative "i-ther" concept that is in line with quantum electrodynamics and Eastern philosophy.

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The Big Bang theory of the creation of the universe gained impetus in 1980 when Alan Guth introduced his idea of "inflation". Unfortunately, the creation it postulated could not be switched off. Consequently, the theory implied that the universe is expanding at a rate billions of billions of times greater than is remotely possible. This presented a problem, that of the "cosmological constant", which to this day remains an unsolved, vexed question as far as cosmologists are concerned. However, as described here, a solution was published in 1994 in Russia.

The Big Bang is said to have started from a "quantum fluctuation" from the void of zero energy (nothingness) that should have collapsed to nothing again after a brief instant. However, before this happened, inflation according to Guth's idea cut in, causing a fantastically rapid explosion during which all the energy we know about appeared from nothing and within a ball of only one-metre radius. From Einstein's $E = mc^2$ equation, energy (E) can transmute into the mass (m) of matter. The gas-like cloud continued to expand under its own inertia, with much of its energy condensing to form the universe of stars and planets that we observe, as described by Guth and Steinhardt (1989). Unfortunately, the theory was flawed from the start due to the problem of the cosmological constant. It also said that the expansion was forever slowing due to gravity.

Then, all cosmologists were astounded and dismayed by the results of observations of remote supernovae, published by B. Schwarzchild (1998), which conclusively showed that expansion is speeding up.

But this is not all that is wrong in both cosmology and physics.

New Scientist, in its 10 December 2005 issue, published an alarming report about the state of physics. It concerned the International Solvay Conference that had taken place in Brussels the previous week. Nobel laureate David Gross, in summing up, admitted that physicists were in a state of utter confusion and that some new approach was needed. Everything they were doing, like string theories and the search for quantum gravity, had failed, but nobody had any idea what to do next.

Now, top physicist Lee Smolin (2007) has recently published a book in which he says that his generation has failed to achieve anything worthwhile in over the last quarter of a century, despite greater numbers of physicists than ever before and unprecedented high levels of funding. The award of $60,000 to Professor Cahill in 2005 to find an alternative to relativity and propose new experiments highlights that physicists are now recognising that Einstein's theories are unsatisfactory. But, as we shall soon see, the theory of Exact Classical Mechanics (ECM) has already provided a satisfactory alternative. Several physicists, including the Nobel laureate Brian Josephson, have attempted but failed to fault the logic.

I think I found the reason for this sad state of affairs way back, starting in 1984, when I discovered an alarming logical error concerning gravity and, later, four logical errors in Guth's inflation theory. Worse, every effort I made to point these out by writing to scientific journals only resulted in letters of rejection which showed that all assessors, except one, had received inadequate grounding in both mechanics and thermodynamics. The one exception was the famous physicist Professor J. Vigier of Paris. In his reply dated 2 August 1987, he admitted that the first critique was valid and said it needed publication. But even he was unable to get it into *Physics Letters A*, for which he was the consultant on gravitation.

When it becomes impossible for sound critiques to get past assessors or editors, then science is in danger of diversion onto false tracks. The evidence suggests that this has already happened. First, let me say that I stand in awe of physicists' brilliance in sophisticated

mathematics, applied to quantum field theory in particular. This theory explains the strange way in which the components of atoms work. The late, famous physicist Richard Feynman (1985) elucidated this quantum electrodynamics (QED) theory.

The final conclusion I reached, however, was that physicists have blind spots that could be readily addressed by people of my own discipline—the mathematically based but practical branch of physics known as mechanical engineering.

In 1987, I therefore set about trying to solve the problem of the cosmological constant. Its seriousness was highlighted two years later when Nobel laureate Steven Weinberg (1989) published an article which said that "[t]he cosmological constant represents a veritable crisis for physics".

It was clear that, to find a solution to the creation problem, it was necessary to introduce the idea of a background medium consisting of primary particles made of two opposite kinds of energy, positive and negative. These had to be equivalent to the *yin* and *yang* of Chinese philosophy. The two kinds form a background that I call "i-ther", and must consist of a balance of these two kinds of primary particle, the "primaries". Opposite kinds could cancel each other to leave the nothingness of the void—a representation of mutual annihilation. Creation would be the converse case, with nothing giving rise to opposite somethings. A basic law of physics known as the *conservation of energy* would be satisfied in this way, and yet the universe could arise spontaneously from nothing.

So, both pure creation and annihilation could now occur. But what would determine which case would apply in given circumstances? The answer was that another basic law of physics, the *conservation of momentum*, also had to be satisfied. What this means is explained in detail with reference to figure 3A1.

Analysis then showed, as explained with reference to figure 7.6, that when primaries of opposite energies collided only two at a time then momentum conservation forced energy gains to occur. Each primary particle gained energy of its own kind in balanced amounts so that, if added together, the sum was zero—the value of the void. Repeated collisions of many such primaries caused a violently explosive creation. Fortunately, the amorphous gas-like fluid so generated was unstable.

If a chosen direction is considered positive, then primaries moving that way are accredited with positive momentum. Identical primaries moving in the opposite direction have negative momentum. Hence, if large numbers arrived at a point or line from all possible directions, then their total momentum would be zero—even before collision. This is also the condition that would result if annihilation occurred.

So, primaries arriving from all directions yielded a condition favouring total annihilation; and since this is also the condition for minimum energy, then annihilation must occur. The whole rapidly growing cloud of primaries was now spontaneously self-organised into myriad flow cells, each cell being minute even compared with an atom. In these, collision breeding continued at an unabated rate. But now, primaries were driven to annihilation

centres in each cell where almost, but not quite, all the energy created was destroyed. A minute net creation remained, causing an ever-accelerating expansion of the universe. The greater the acceleration, the greater the i-theric density needed to produce that acceleration. This resulted in a smaller net rate of creation since, at some high densities, primaries became so crowded that annihilation dominated. So, a feedback mechanism existed to control the now slowly accelerating expansion.

A creation scenario had now appeared that provided a paradox-free solution to the problem of the cosmological constant and, at the same time, yielded the prediction of a universe in a state of ever-accelerating expansion, so matching observation. This was predicted in 1992, long before its observation in 1998.

ECM theory: an alternative to relativity

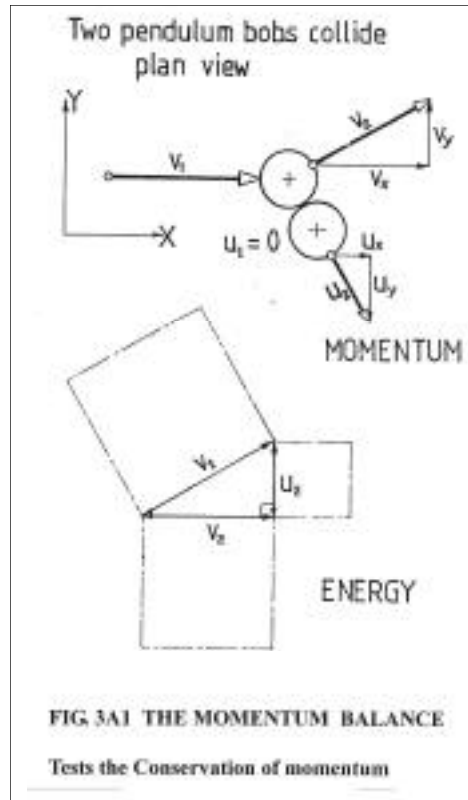For those who need more detail, the new approach is based on revisions of Newtonian mechanics as described in the new book by Pearson (2007). Revision of Newton's original mechanics was required, since it is inadequate for representing objects moving at very high speeds or in strong gravitational fields. Einstein's general theory of relativity matched most observations under these circumstances, but unfortunately could not be applied to the creation problem because his postulates made his theory incompatible with the existence of any kind of background—and, of course, the i-ther is such a medium.

Consequently, a replacement had to be derived before the creation problem could be fully addressed. I started from scratch to produce a totally different mechanics that did not rely on any kind of relativity theory. It had to avoid internal contradiction and incompatibility with quantum theory. A solution was found by adopting Newton's three laws of motion and Euclidean geometry, with universal time and with all motion, inclusive of light in a vacuum, measured from an absolute datum, meaning local space.

The resulting ECM derivation fits all the experiments, usually considered Einstein's unique achievements even though his "time dilation" does not exist (clocks simply run slow due to mass increase). Does this also provide a solution for the problem of quantum gravity? It certainly eliminates the difficulties that have prevented general relativity from providing this "holy grail" of the physicists after more than 60 years of futile worldwide effort.

Unfortunately, publication in Western journals was found to be impossible. All assessors made it clear that relativity must not be challenged. Fortunately, the famous inventor of the caesium-beam atomic clock, Dr Louis Essen, FRS, came to the rescue by proposing that I deputise for him at a forthcoming scientific conference in Russia where, he said, I would find scientists with more open minds. So the ECM theory was published in the *Proceedings* of the Petrovskaja Academy of Sciences and Arts (Pearson, 1991), following the presentation in St Petersburg. The solution for the cosmological constant is embedded in a paper resulting from the next conference in 1993 (Pearson, 1994).

Two pendulum bobs collide
plan view

MOMENTUM

ENERGY

FIG. 3A1 THE MOMENTUM BALANCE

Tests the Conservation of momentum

Later, the reason for failure to surmount the barriers of peer review in the West came from the disillusioned Australian physicist Brian Martin (1997). In his book, he shows that the assessors of physics journals operate a "secret closed shop" which renders publication impossible in the West unless an author has a PhD in physics as a minimum qualification. The assessors refuse to recognise any contribution from the discipline of engineering.

Information source required

There is more to relate. Quantum physicists are now saying that matter needs a source of information to organise atoms, as much as it needs energy. But where is the source of that information? The evolving new theory suggests that the i-ther might have evolved a conscious intelligence. Analysis shows that annihilation centres are more than dots or lines: they are blobs or filaments occupying a surprisingly large proportion of the total volume of space. Primaries are constantly arriving at their surfaces, move in under their own inertia and mutually squeeze each other out of existence. A tangle of filaments connecting with blobs can arise, forming an infinite variety of shapes. Furthermore, enormous power is generated in each i-theric cell between creation and annihilation.

Such conditions match those that, according to Gribbin (2004), create spontaneous organisation by chaos. The i-theric structure can be arranged to look like replicas of the neural networks of our brains and might have arisen by a form of evolution from such self-organisation. So, background intelligence might exist that is able to organise energy to create what we see as matter.

This is not the first time that background intelligence has been inferred. Dr N. A. Kozyrev (http://www.divinecosmos.com), in uncovering his "torsion fields", shows he considers an intelligent "aether" must exist. However, he gives no detail of its structure and, according to the new approach, the aether or, alternatively, the "quantum vacuum" would exist as the next emergent level of existence. Pearson (1997) describes how consciousness could be connected with the solution to the problem of the cosmological constant (publication was achieved in a Western scientific journal simply by avoiding mention of qualifications altogether).

Black holes and accelerating growth

Another finding is that black holes described by ECM theory are very different from those of general relativity. Black holes no longer have "event horizons" inside which time goes backwards, nor do they house matter at impossible "singularities".

In ECM theory, primaries, not matter, exist as cores of finite size in a process of mutual annihilation at the centres of black holes. So they are now seen as supplementary annihilation centres. They help reduce the acceleration of the expanding universe.

However, if the acceleration were to cease altogether, the i-theric density would fall to zero and then everything would vanish back into the void from which it emerged. It is a frightening thought that the universe must exist in a state of accelerating growth forever—or disappear!

FIG. 7.6 BREEDING COLLISIONS

v for velocity +ve energy
u for velocity −ve energy

Details of momentum conservation

Figure 3A1 from the new book (Pearson, 2007) gives a plan view of a momentum balance. It consists of two pendulums of identical length and having spherical bobs. The fulcrums are arranged so that the balls just touch when hanging still. The threads holding the high-bounce balls (or two one-inch-diameter ball bearings) are preferably not less than about two metres long, and the horizontal distance of the swing is limited to a quarter of the length of the pendulums. Then the speed at impact is directly proportional to the horizontal distance of the swing to better than adequate accuracy. Every science classroom should have a momentum balance, since it confirms the law of conservation of momentum, shows what it means and gives the student a very hands-on understanding of the physical meaning of the terms "positive" and "negative".

In the example shown, a "driver" ball is set in motion to hit a stationary "driven" ball. The driver ball of mass m_a makes contact at velocity v_1 with the driven ball of mass m_b. Then both scatter with velocities v_2 and u_2 respectively. However, it is the "components" such as v_x of these scatter velocities which are of primary interest. The product of mass m and velocity v or u defines momentum. Velocity is speed with the direction of motion also defined. An arrow to a scale representing the magnitude mv or mu, with the arrowhead pointing in the direction of motion, can be used to represent momentum. In figure 3A1 (upper), v_x is the "component" of velocity v_2 measured in the X direction, and a component of momentum can also be represented by an arrow pointing in the X direction.

We consider the driver ball moving in direction X at first and calculate its momentum $m_a v_1$. Then we measure and add the two momentum components $m_a v_x$ and $m_b u_x$. In every experiment, whatever the masses m_a and m_b, which can be identical or different, it is found that the sum of these two scatter momenta is equal to $m_a v_1$, the initial momentum of the driver ball. This demonstrates what is meant by the conservation of momentum. In this example, the balls had equal mass, so, in this special case, the arrows can represent velocity as well as momentum.

But the balls scattered in the Y direction as well. Although neither ball had any initial momentum in this direction, both leave with momentum in this Y direction. Has this violated momentum conservation? No. This is where the idea of positive and negative come in. The upward direction of Y is arbitrarily called the positive direction, so the opposite direction is called the negative direction. So one ball has a positive momentum component $m_a v_Y$, with the other $-m_b u_Y$. The experiment shows that these cancel to zero: the same as the initial total. So again, momentum is conserved.

Both balls can be in motion before impact; and even if the balls are made of plasticene and stick together, the law is still found to hold true. Also, this law can be derived by simple algebra from Newton's laws of motion and so the experiment also confirms these laws. It therefore also provides a useful example of the scientific method in which experiment is used to check theory.

Kinetic energy is proportional to the square of speed, and the lower figure (3A1), based on the theorem of Pythagoras, shows that if this is also conserved then a right-angled triangle is produced.
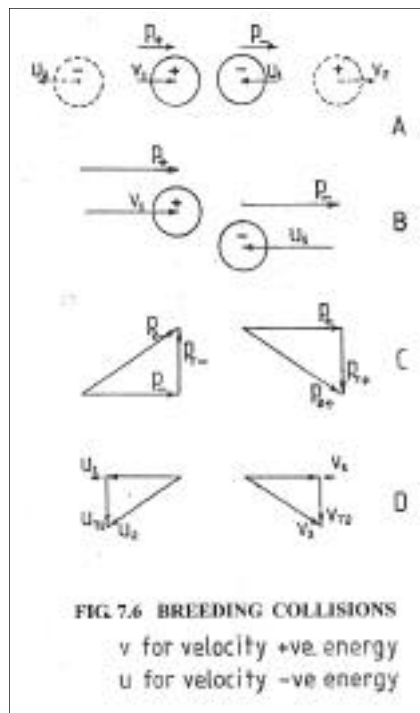
However, this is never quite achieved since some of the kinetic energy is always dissipated as friction and converted to useless heat.

What is also of great interest for solving the creation problem, however, is the reversal in direction of all momentum arrows in the upper figure, to represent primaries of negative mass. This means that these primaries are made of negative energy, and inspection shows that momentum is again conserved. It follows that our universe could be made of negative energy and we would never know this is so! Consequently, negative energy is just as probable as the positive kind and works as its mirror image. To solve the creation problem, it is necessary to consider the existence of both kinds at the ultimate level of reality and then find what happens when the two kinds interact by collision.

Collision breeding

The ECM theory shows that energy, not mass, is the true building substance of everything in existence, as shown by Pearson (2007). From Newton's second law, an unrestrained object, when pushed by a "force of action", moves in the direction that the force is pointing. A force, pushing an object free to move, causes it to accelerate. The moving force produces "mechanical work", a form of energy that is transferred to the object, causing it to gain the energy of motion. This "kinetic energy" adds to the "rest energy", from which the object was made when standing still, to yield a "sum energy", corresponding to "inertial mass". This means that mass increases with speed, in contrast to the assumption used in the original Newtonian mechanics.

Negative energy primaries accelerate in the opposite direction to the force of action so that the energy of mechanical work is negative. This negative energy adds to the negative rest energy from which the object is made, so that a mirror image of the positive kind appears. Two negative primaries in collision will bounce away, just as do billiard balls as illustrated in figure 3A1, so there is nothing strange about negative kinds. It is only when opposites interact that strange things are predicted.

Now that the law of conservation of momentum is understood, it can be applied to the collision breeding of opposites, as illustrated by figure 7.6 taken from the new book. At A, primaries of positive and negative energies meet head on. Since the negative primary carries momentum p_- in a direction opposite to its motion, the momenta of both collision partners point in the same direction and so add up to $p_+ + p_-$. The only condition to maintain momentum conservation across the collision is for both to remain unchanged.

At B, the collision is offset so that scattering occurs. No change of momentum can occur in the X direction for the same reason as applied to case A, but now transverse momenta p_{r+} and p_{r-} are added in both positive and negative Y directions so that they cancel. However, as shown at C, these add to those in the X direction (vectorially, as illustrated) so that each has an increased momentum p_2 as compared with the incident value p. An increase in momentum demands an increase in energy, and so each primary has been forced to gain energy of its own kind by the collision. Then, as shown at D, both are deflected in the same transverse direction. In this example, the masses were assumed to be equal and opposite. Then it is readily shown that the added momentum component has to be exactly transverse, as otherwise the two energy gains will not balance.

In general, collisions occur at all angles between 0 and 180 degrees, but a complete analysis taking this into account shows that, on average, there is an energy gain from the two particle collisions of primaries of opposite energies equal to 20 per cent of initial kinetic energies.

Further detail can be obtained from my book *Creation Solved?*, published in April 2007. It is mainly descriptive but is a primer for a mathematical text to follow shortly (see the website http://www.pearsonianspace.com). For people not so mathematically inclined, I would like to end by drawing attention to the appendix. Most people think they will never understand maths since it looks too difficult—but appearances can be deceptive! I have therefore set out a simple derivation with every step fully explained. Please try to follow this slowly and carefully. Then I am sure you will see the light.

This derivation has also been selected to illustrate one of the simple blind spots which physicists and cosmologists seem so prone to having. That the universe is in a state of ever-accelerating expansion has been staring them in the face since 1929, and none of them, even today, seems to have noticed that this is so!

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Ronald D. Pearson is a mechanical engineer with over 17 years' university teaching experience in fluid mechanics and thermodynamics. The inventor of a "gas wave turbine", he is a fervent exponent of engineering physics being regarded as a high-status discipline. His book *Creation Solved? Part I* (see review in this edition) sets out a "Big Breed" theory that shows up flaws in the Big Bang theory.

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